CS-271, Intro to A.I. — Quiz # 1 — Fall Quarter, 2010 — 15 minutes

1. (2 pts) NAME AND EMAIL ADDRESS: _____

YOUR ID: _____ ID TO RIGHT:_____ ROW:_____ NO. FROM RIGHT:_____

2. (30 pts total, 2 pts each) For each of the following terms on the left, write in the letter corresponding to the best answer or the correct definition on the right. The first one is done for you as an example.

A	Agent	A	Perceives environment by sensors, acts by actuators
K	Percept	B	All states reachable from the initial state by a sequence of actions
P	Performance Measure	C	Guaranteed to find a solution if one is accessible
L	Rational Agent	D	Process of removing detail from a representation
B	State Space	E	Maximum number of successors of any node
I	Search Node	F	Set of all leaf nodes available for expansion at any given time
N	Link between nodes	G	Estimates cost of cheapest path from current state to goal state
J	Path	H	Guaranteed to find lowest cost among all accessible solutions
D	Abstraction	I	Represents a state in the state space
H	Optimal Search	J	Sequence of states connected by a sequence of actions
C	Complete Search	K	Agent's perceptual inputs at any given instant
M	Expand a state	L	Agent that acts to maximize its expected performance measure
F	Frontier	M	Apply each legal action to a state, generating a new set of states
O	Search Strategy	N	Represents an action in the state space
E	Branching Factor	O	How a search algorithm chooses which node to expand next
G	Heuristic Function	P	Evaluates any given sequence of environment states for utility

3. (8 pts total, 2 pts each) Your book defines a task environment as a set of four things, with the acronym PEAS. Fill in the blanks with the names of the PEAS components.

P<u>erformance measure</u> E<u>nvironment</u> A<u>ctuators</u> S<u>ensors</u>

4. (30 pts total, -2 for each wrong answer, but not negative) Fill in the values of the four evaluation criteria for each search strategy shown. Assume a tree search where b is the finite branching factor; d is the depth to the shallowest goal node; m is the maximum depth of the search tree; l is the depth limit; step costs are identical and equal to some positive ε; and in Bidirectional search both directions use breadth-first search.

Criterion	Complete?	Time complexity	Space complexity	Optimal?
Uniform-Cost	Yes	O(b^(1+floor(C*/ε)))	O(b^(1+floor(C*/ε)))	Yes
Depth-Limited	No	O(b^l)	O(bl)	No
Iterative Deepening	Yes	O(b^d)	O(bd)	Yes
Bidirectional (if applicable)	Yes	O(b^(d/2))	O(b^(d/2))	Yes

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5. (30 pts total, -2 for each wrong answer, but not negative) Use the following tree to indicate the order that nodes are expanded, for different types of search. Assume that A is the start node and G (double box) is the only goal node. Here, path costs are shown to the right of each path, g = cost of path so far, h = estimate of remaining cost to goal, f = estimate of total path cost.

a. Uniform-cost search.

A, C, F, G

b. Iterative deepening depth-first search.

A; A, B, C; A, B, D, E, C, F, G

c. Greedy best-first search.

A, B, E, D, C, G

d. A* search.

A, C, G

e. Is the heuristic h admissible? (Y or N) __N__
For example, h(A)=100, but the optimal cost to the goal node G is only 70. Thus, h(A) sometimes OVER-ESTIMATES the remaining optimal distance to G, and so is not admissible.